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ABSTRACT

The M-5 Project is a sequential physical education program for children in the primary grades and intermediate grades. It embodies the main concepts of the movement education approach. Activities are individualized, based on needs identified by results of physical fitness tests, that are carried out in 30-minute daily sessions at a series of six Movement Activity Centers. Activities at each center are prescribed by a series of curriculum cards, color-coded according to levels of difficulty. Children rotate from center to center at five-minute intervals and progress from card to card at each center as skills are developed. Self-direction is expected. Work at Movement Activity Centers is interspersed with regular weekly self-testing and small- and large-group creative play experiences. Throughout the period in which the program was developed, children were tested to determine the effectiveness of the program. Results of analysis of third-year pre-post data of project children revealed that over 91 percent of project children achieved gains that were significant at the .01 level. Supplementary information on effectiveness is provided as well as comparisons with control groups. Cost information for operating the program is presented, as well as a discussion of the educational significance of the results and the applicability of the program to other situations. (DS)

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APPLICATION FOR SUBMISSION TO THE JOINT DISSEMINATION REVIEW PANEL (JDRP)

Date: March 14, 1978

I. TITLE OF PROJECT:

Sequential Physical Education Reform: The M-5 Project

II. DEVELOPER:

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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III. FUNDING:

This project was funded through a three (3) year grant of ESEA Title IV-C. Levels of funding were 1975-$65,000; 1976-$75,000; 1977-$75,000.

IV. DEVELOPMENT PERIOD:

This project was developed during the 1974-77 school years. The first year was spent in organization, curriculum materials development, and preliminary trials. The second year was spent in trying out and revising the process. The third year was a full scale tryout of process and materials. The outcomes reported here are from the third year of project operation.

V. PRODUCTS AND PRACTICES:

The M-5 Program is a sequential physical education program for children in the primary and intermediate grades. It embodies the main concepts of the movement education approach to physical education. Activities for children are individualized, based on needs identified by results of physical fitness tests, which are carried out in 30-minute daily sessions at a series of six Movement Activity Centers. Activities at each center are prescribed by a series of curriculum cards, color-coded according to levels of difficulty. Children rotate from center to center at 5-minute intervals and progress from card to card at each center as skills are developed. Self-direction is expected, and children report to initial and subsequent Movement Activity Centers on their own. Teachers set out materials and equipment and change cards as necessary, usually every 1-2 weeks. Work at Movement Activity Centers is interspersed with regular weekly self-testing and small and large group creative play experiences.

Throughout the development period, children were tested to determine the effectiveness of the program. Specifically, the third year objective which was assessed is stated as follows:

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"By the end of the project period, 85% of participating children will demonstrate a significant increase in physical fitness, as evidenced by results of the Kirchner Physical Fitness Test for Elementary School Children"

Results of analysis of third year pre-post data of project children revealed that over 91% of project children achieved gains which were significant at the .01 level. Supplementary information on effectiveness is found in Section VI, Tables 1, 2, and 3.

The Kirchner Test is designed for use with elementary grade children and was normed on 32,063 children from both rural and urban populations within six states. It correlates .811 with the American Alliance of Health, Physical Education and Recreation (AAHPER) Youth Fitness Test and has demonstrated test-retest reliability of .764-.948 for individual test items. The comparison group was drawn from a non-project school within the school system and consisted of children whose academic, physical, economic, social and geographic situation was judged to be closely similar to those in the project schools. The children for which the program was developed were from a small, semi-rural, mountain town. The children in project schools were not screened for inclusion in the program--all were served. Approximately 5% of the participants were black.

The program can be adopted by another school (up to 800 students) for about $2,120.00 assuming that all recommended materials and equipment need to be purchased. This cost is only approximate as it is likely that many items are already in the typical school. Cost itemization includes: staff training - $150.00 per system if all teachers get the training together; equipment - $850.00 per school; materials and supplies - $1,120.00 per school; consumables - none; other costs - none; special facilities are not required as the program can be implemented in almost any spacious area.

NOTE: The main curriculum materials necessary to implement the program is a set of Movement Activity Center Curriculum Cards. The set was developed, field-tested and revised over a three-year period by the project staff and consists of more than 1000 individual 8"x5" cards. These are coded with separate activities for primary and intermediate grade students, and include a number of "Movement Motivator" cards which suggest activities for creative play periods. Two teacher handbooks accompany these cards. One describes the card sequence and coding, base-line testing, gives norms, lists equipment needs and describes the report card format. The second book is a how-to-do-it publication giving written and visual directions describing each activity and how to perform it. The cards and two booklets are available for about $30.00/set.

Attempts to certify that quantitative measures were reliable and valid included an independent review by an external, out-of-state, validator who interviewed the project evaluator to determine the design used, the procedures which were followed and the appropriateness of the control group sample. Individual progress records were randomly selected and reviewed. Student records at the school were reviewed to determine

if the raw scores were accurately converted to the normative score. Out of the 200 records interviewed one error in conversion was found. The error underscored the student by 3 points. The transfer of the data from the records to the evaluator data sheets was also spot checked and no errors found. The analysis procedures were triple checked by the project evaluator and the validator and no errors found.

Further, the analysis procedures were found appropriate for providing the data needed for measuring the objective. The calculations and procedures used by the evaluator were checked and found to be appropriately executed both for measuring the objective and for the supplemental information with the comparison group. Calculations were redone from the original data sheets and the results were found to be accurate.

During the validation team's visit, supplemental data was provided on-site by the project evaluator. The data was a t-test comparison of the project and comparison group pretest-posttest in mean gain in total scores. The results were significant at the .01 level.

Data for the project were collected by the project staff under the supervision of an external evaluator under contract to the local education agency. All data processing was done by this person and members of the consulting firm of Carolina Educational Consultants, 713 Greenwood Road, Chapel Hill, North Carolina 27514. Their work was reviewed as stated above by Dr. Sally Warder, Validation Consultant for Effectiveness/Success, from Greenville, South Carolina on May 16-18, 1977.

VI. EVIDENCE OF EFFECTIVENESS:

1. Evidence that something happened:

As indicated, the effectiveness of the project was assessed by analysis of pre-postscores on a normed physical fitness test, comparing project children with a comparison group. Table 1 reveals that more than 91% of project children increased their fitness and this increase was significant at the .01 level when compared with the comparison group mean gain.

TABLE 1

PERCENT GAIN IN PHYSICAL FITNESS BY
CHILDREN IN THE TOTAL GROUP
(THIRD YEAR)

Group	N	Mean Kirchner Total Score Pre-Test	Mean Kirchner Total Score Post-Test	Mean Gain	% Gain	SD	
Project	793	255.76	285.57	29.81	91.3%	24.06	t = 5.19
Comparison Group	99*	227.49	244.12	16.63	78.8%	21.72	p = <.01

*Sample was drawn by selecting every fifth child on teacher's roll.

The Physical Fitness Test for Elementary School Children (Kirchner) was utilized to provide data on the level of physical fitness of students in the project. Pre-test data was obtained in early Fall 1976 and post-test data obtained in the Spring of 1977.

Students in two Project schools, and a comparison group in another school were tested individually with the Kirchner battery.

The five item Kirchner test battery is designed to be administered with a minimum of facilities and equipment by classroom teachers. The test battery is intended to measure strength, endurance, power and speed--all considered essential elements of physical fitness. The five test items are (1) standing broad jump, (2) bench push-ups, (3) curl-ups, (4) squat jump and (5) 30-yard dash.

Points are awarded according to the distance jumped, the number of push-ups, curl-ups and squat jumps executed and for the time elapsed in the 30-yard dash. These points are totalled and an overall fitness score is derived. Kirchner provides tables so that numerical fitness ratings according to age and sex can be assigned. These numerical fitness levels are 5 - Poor, 4 - Below Avergage, 3 - Average, 2 - Good, 1 - Excellent.

Validity: correlates .811 with the AAHPER Youth Fitness Test

Reliability: test-retest procedure

standing broad jump	.764
bench push-up	.889
curl-up	.948
squat jump	.930
30-yard dash	.840

Norm group: 32,063 youngsters from urban and rural populations within six states.

Project staff administered all of the Kirchner items utilizing testing procedures recommended by Kirchner. Administration procedures took into consideration the health status of participating students, provided for the orientation of students being tested, and the equipment and space needed for effective testing.

Sampling was not used in the two project schools. The nature of the project, local prevailing conditions and local politics dictated the involvement of all youngsters in each participating school in all project activity. Random assignment to project and comparison groups, while desirable from an evaluation perspective, was not feasible.

Sampling was utilized in a similar non-project school from which a comparison group was selected. A sample of each grade level was drawn by selecting every 5th student as listed in the teacher's roll book at each grade level. NOTE: Third year project and comparison group subjects differed to the extent that project subjects had been involved in the intervention strategies during the first and second years.

All testing was conducted by project staff including the project director, project instructors and project aides. Utilizing these specially trained test administrators allowed for the development of uniform testing procedures as well as uniform and standard procedures for recording data. The recommended testing procedure were discussed by the project staff until thoroughly understood to assure "rater reliability" and then utilized in all pre- and post-testing. The test was administered to each individual student. First level verification of actual test data occurred within the testing team. In addition, all testing procedures and data recording techniques were monitored by the project director and verified by external evaluators through conferences with project staff in the project centers.

Results of pre-test, post-test procedures comparing project and comparison student gains indicate that the M-5 Project is effective to a significant degree for both the primary and intermediate groups. The results are shown in Tables 2 and 3.

TABLE 2

GAIN IN PHYSICAL FITNESS BY CHILDREN
IN THE PRIMARY GROUP
(THIRD YEAR)

Group	N	Mean Kirchner Total Score Pre-Test	Mean Kirchner Total Score Post-Test	Mean Gain	SD	
Project Primary	431	251.14	283.30	32.16	25.60	t = 3.90
Comparison Primary	61	221.15	239.79	18.64	23.60	p = <.01

TABLE 3

GAIN IN PHYSICAL FITNESS BY CHILDREN
IN THE INTERMEDIATE GROUP
(THIRD YEAR)

Group	N	Mean Kirchner Total Score Pre-Test	Mean Kirchner Total Score Post-Test	Mean Gain	SD	
Project Inter-mediate	362	265.38	292.39	27.01	21.79	t = 3.72
Comparison Inter-mediate	38	231.62	245.02	13.40	18.15	p = <.01

2. Reliability of the Effects

Among the evidences that results of the project intervention are reliable enough to occur again under similar circumstances is the success which the project has demonstrated over a period of several years. Data indicating this success is presented in Tables 4 and 5 and 6. (NOTE: Evaluation designs for first and second years were different from the third and final year and did not include comparison groups. Thus, data are presented differently for first and second years.)

TABLE 4

MEAN KIRCHNER FITNESS LEVEL RATINGS
FOR FIRST YEAR

Group	N	Mean Kirchner Pre-Test (Sept.)	Mean Kirchner Post-Test (May)	Mean Change
Primary	378	3.5	2.2	+1.3
Inter-mediate	411	3.4	2.2	+1.2
Total	789	3.45	2.2	+1.25

NOTE: Fitness Levels:

5 - Poor
4 - Below Average
3 - Average
2 - Good
1 - Excellent

TABLE 5

PERCENT GAIN IN FITNESS LEVEL RATINGS
FOR FIRST YEAR

Group	N	% Average or Better (3-2-1) on Kirchner Pre-Test (Sept.)	% Average or Better (3-2-1) on Kirchner Post-Test (May)
Primary	378	50.0%	91.2%
Inter-mediate	411	57.9%	93.4%
Total	789	53.95%	92.30%

NOTE: For project children, 91.63% improved at least one rating scale point during the first year.

TABLE 6

PERCENT GAIN ON INDIVIDUAL KIRCHNER TEST ITEMS
FOR THE SECOND YEAR

Group	N	Broad Jump	30-Yard Dash	Curl-Ups	Bench Push-Ups	Squat Jump
Primary	425	89%	80.2%	67.4%	67.9%	84.5%
Inter-mediate	384	75.5%	72.5%	64.4%	63.4%	79.3%
Total	809	82.7%	76.3%	65.9%	65.6%	81.9%

Further, the project validator on exportability interviewed a sample of teachers in non-project schools where project activities have been introduced. Her evidence indicated that an adopter could obtain similar results.

Finally, the project is being adopted by several other North Carolina school systems. Although not as rigorously evaluated, indications are that they are experiencing similar results.

3. Educational Significance

In terms of educational significance it is important to remember that gains of children in project schools outscored those in a comparison group to a significant degree. This was achieved in spite of the involvement of the comparison group in a regular but more traditional physical education program. The physical education program for the comparison group consisted of daily 30-minute activities, done by the students in unison, under the direction of either a physical education specialist or classroom teachers. Activities were varied from week-to-week at the direction of a physical education specialist. They were not sequential and not intended to be individualized or self-directive.

One very important aspect of educational significance is that this program is designed to be implemented by the regular classroom teacher. Except for brief in-service training, (two, three-hour sessions), no other special qualifications are needed. This is in contrast to the usual situation where a trained physical education specialist is necessary to conduct and direct the fitness activities for participants. In this program the children are self-directive and teachers simply manage the Movement Activity Center cards and materials.

4. Generalizability

In terms of applicability to similar populations it is felt that the program is generalizable and will accomplish similar results at other sites.

In its development, both rural and urban school populations were involved and project schools varied in size from less than 250 to 450 in size. It is true that the community is small, with a total county population of less than 30,000, and it is in the western North Carolina Appalachian region where the per capita income is less than $3,000.00.

The communities where the program is being adapted are larger in terms of size and per capita income and the program is doing well.

5. Evidence That Effects Are Attributable to the Practice

In support of the claim that the effects are attributable to the product or practice, it is offered that the pre-test, post-test, experimental-control design helps establish the legitimacy of the outcomes perceived.

Campbell & Stanley in the Handbook of Research on Teaching (1963) assert that a pre-post, control group design answers most concerns about internal validity. Specifically, they state that such a design deals effectively with rival hypotheses related to history, maturation, testing, instrumentation, regression, selection, mortality and interactions between these factors. Thus, it is felt that a good case can be made that the intervention process, in this instance the daily 30-minute sequential movement activity sessions, was quite likely responsible for the student performance outcomes. This feeling is enhanced by the fact that children achieved these results in several schools both rural and urban.

The comparison school population was judged by school system staff and evaluators to be the most similar to the project school's population of any others in the school system. Both the project and comparison schools serve urban communities as well as surrounding rural populations. Curricular programs are similar in all schools and the comparison school has not been involved with exemplary project activity. The physical education program is the

same as in all other McDowell County schools with the exception of the project school's.

In terms of external validity, there are no factors which can be determined to affect the treatment activities so as to decrease external validity. The program design featured regular, daily, sequential, individualized, 30-minute activity periods for the experimental group while the comparison group engaged in another type of physical education program. It was expected that the experimental program would result in increased levels of physical fitness by the participants. Data reveals that such occurred, to a significant degree, over the comparison population.

VII. COST INFORMATION

	INSTALLATION Non-Recurring Costs	SUBSEQUENT YEARS Recurring Costs
Staff Training	$150.00/all teachers in the system	None - Except for new teachers coming into the system
Special Facilities	None required	None
Equipment, Materials and Supplies	$1970.00/school of up to 800 students (if none already available)	None except to replace lost items
Consumables	None	None
Other Costs	None	None
TOTAL COSTS	$2,120.00	None to Minimal

NOTE: Training costs would include costs of materials and supplies for up to 50 teachers in two three-hour training sessions. No special facilities are needed except for some spacious area such as a playroom, cafeteria, unused hall way, out-of-doors playground, etc. Equipment, materials and supplies include a set of curriculum cards ($30.00) and except for replacing lost or damaged items, would be one-time costs.